



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,191	06/20/2003	Douglas L. Keil	LAMIP175/P1148	8804

22434 7590 07/25/2007
BEYER WEAVER LLP
P.O. BOX 70250
OAKLAND, CA 94612-0250

EXAMINER

ARANCIBIA, MAUREEN GRAMAGLIA

ART UNIT	PAPER NUMBER
----------	--------------

1763

MAIL DATE	DELIVERY MODE
-----------	---------------

07/25/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/600,191

Applicant(s)

KEIL ET AL.

Examiner

Maureen G. Arancibia

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 May 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2,3,5-14 and 18-26 is/are pending in the application.
- 4a) Of the above claim(s) 11-14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2,3,5-14 and 18-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 May 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

1. Claim 25 is objected to because of the following informalities: the spelling of the word "greater" should be corrected. Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claims 2, 3, 5-10, and 18-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,074,518 to Imafuku et al. in view of U.S. Patent 6,019,060 to Lenz.**

In regards to Claim 2, Imafuku et al. teaches a plasma processing apparatus for processing a substrate (Figures 11 and 12), comprising: a plasma processing chamber 2 with chamber walls (Figure 11); a substrate support 5 within the chamber walls; and a magnetic source for generating a magnetic field for magnetically enhancing the confinement of the plasma, wherein the magnetic source comprises a first magnetic element 73 comprising magnets 74 provided around the substrate support 5, and a second magnetic element 71 comprising magnets 72 provided around the upper electrode 2.

In regards to Claims 2, 9, and 20, Imafuku et al. does not expressly teach that the apparatus further comprises first and second confinement rings placed within and

spaced apart from the chamber walls and between the first and second magnetic elements, such that the magnetic elements are spaced apart from the confinement rings and on opposite sides of the confinement rings, and placed such that magnetic field lines passing from the first magnetic element to the second magnetic element pass through the confinement rings; the confinement rings being moveable to define a variable gap used to vary pressure in the plasma volume.

Lenz teaches first and second confinement rings 316, 320 (Figure 3) placed within a chamber and spaced apart from the chamber walls (ex. Figure 1), the confinement rings defining a plasma volume in combination with a substrate support 104, the confinement rings being moveable to define a variable gap used to vary pressure in the plasma volume. (Column 7, Lines 22-56)

It would have been obvious to one of ordinary skill in the art to modify the apparatus taught by Imafuku et al. to incorporate the vertically arranged and moveable confinement rings taught by Lenz. The motivation for making such a modification, as taught by Lenz (Column 7, Line 64 - Column 8, Line 25), would have been to allow local control of the pressure at the substrate surface during plasma processing, and thereby, among other benefits, to improve response time.

Since the first and second magnetic elements 73, 71 taught by Imafuku et al. are arranged around the substrate support and the upper electrode, respectively, they would have the claimed spatial relationship to the confinement rings taught by Lenz, and the vertical magnetic field produced by the magnetic elements would pass through the confinement rings, as broadly recited in the claims.

In regards to Claim 3, it is considered that the magnetic elements of Imafuku et al. are structurally identical to the claimed magnetic elements, and would inherently cause increased collisions of charged particles with the confinement rings taught by the combination of Imafuku et al. and Lenz, *due to the interaction between the vertical magnetic field and the charged particles in the plasma*. When a rejection is based on inherency, a rejection under 35 U.S.C. 102 or U.S.C. 103 is appropriate. (See *In re Fitzgerald* 205 USPQ 594 or MPEP 2112). Moreover, it has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). Also, a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987)

In regards to Claims 5 and 8, these claims recite relative dimensions of the first and second magnetic elements and the first and second confinement rings. The combination of Imafuku et al. and Lenz does not expressly teach a specific dimensional relationship between the magnetic elements and the confinement rings. However, in *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), the Federal Circuit held that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not

patentably distinct from the prior art device. Similarly, in the instant case, the inner and outer diameter of the confinement rings is not believed to cause a difference in performance of the apparatus, since narrower or wider confinement rings would still be just as capable of closing and opening the variable gap. Therefore, the relative dimensions between the confinement rings and the magnetic elements is similarly considered not to patentably distinguish the claimed invention from that taught by the combination of Imafuku et al. and Lenz.

In regards to Claims 6 and 24-26, Imafuku et al. does not expressly teach that the diameter of the first magnetic element is not equal to, and specifically less than the diameter of the second magnetic element, thereby causing the first magnetic element to be provided nearer to the inner edge of the at least one confinement ring and the second magnetic element to be provided nearer to the outer edge of the at least one confinement ring.

However, Imafuku et al. teaches that the magnetic elements generate a particular magnetic field that then determines the confinement of the charged particles within a plasma volume.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, as a matter of routine experimentation, to provide first and second magnetic elements having different diameters, specifically such that the diameter of the first magnetic element is less than the diameter of the second magnetic element, thereby causing the first magnetic element to be provided nearer to the inner edge of the at least one confinement ring and the second magnetic element to be provided

Art Unit: 1763

nearer to the outer edge of the at least one confinement ring, in order to optimize the particular magnetic field that is produced and the confinement of the charged particles within the plasma volume.

The magnetic field lines passing from the first magnetic element with a smaller diameter to the second magnetic element with a larger diameter would inherently pass through the confinement ring in a canted manner, due to the angle between the first and second magnetic elements. When a rejection is based on inherency, a rejection under 35 U.S.C. 102 or U.S.C. 103 is appropriate. (See *In re Fitzgerald* 205 USPQ 594 or MPEP 2112).

In regards to Claim 7, the vertical magnetic field produced by the magnetic elements taught by Imafuku et al. would pass through the region of the confinement rings taught by the combination of Imafuku et al. and Lenz, as broadly recited in the claim.

In regards to Claim 10, the first and second magnetic elements 73, 71 as taught by Imafuku et al. would be located below and above the variable gap formed by the confinement rings taught by the combination of Imafuku et al. and Lenz, and therefore would not "cross" the variable gap, as broadly recited in the claim.

In regards to Claim 18, each of the first and second magnetic elements as taught by Imafuku et al. has a pole from a north pole to a south pole, wherein the pole of each of the first and second magnetic elements has a direction that extends between a chamber top to a chamber bottom (i.e. has a vertical direction), as broadly recited in the claim. (Figure 12)

In regards to Claim 19, the vertical magnetic field lines passing from the first magnetic element 73 to the second magnetic element 71 as taught by Imafuku et al. would pass through the sides of the confinement rings that form the largest surfaces of the confinement rings taught by the combination of Imafuku et al. and Lenz at an angle of approximately 90 degrees, which falls within the range recited in the claim of being between perpendicular and 45 degrees.

In regards to Claim 21, since the confinement rings taught by the combination of Imafuku et al. and Lenz are arranged vertically, the pole of the first magnetic element 73 would have a direction that extends from the first to the second confinement ring (i.e. vertically); as broadly recited in the claim.

In regards to Claim 22, see the discussion of Claim 19.

In regards to Claim 23, the first and second magnetic elements 73, 71, as taught by Imafuku et al., are within the chamber walls. (Figures 11 and 12)

Response to Arguments

4. Applicant's arguments filed 15 May 2007 have been fully considered but they are not persuasive.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re*

Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, it would have been obvious to one of ordinary skill in the art, with a reasonable expectation of success, to modify the apparatus taught by Imafuku et al. to incorporate the vertically arranged and moveable confinement rings taught by Lenz, in order, as taught by Lenz (Column 7, Line 64 - Column 8, Line 25), to allow local control of the pressure at the substrate surface during plasma processing, and thereby, among other benefits, to improve response time. That Imafuku et al. already teaches that the magnetic rings provide a means for trapping the plasma within a desired space would not deter one of ordinary skill in the art from combining the teachings of Imafuku et al. with those of Lenz, with a reasonable expectation of success in attaining an additive benefit, as taught by Lenz, of allowing local control of the pressure at the substrate surface during plasma processing. Moreover, Applicant has not presented any evidence tending to show non-obviousness of combining the teachings of Imafuku et al. and Lenz, such as evidence of unexpected results in combining the magnetic elements with the confinement rings.

In response to applicant's argument that the confinement rings of Lenz would not necessarily be placed in alignment with the magnets of Imafuku in order for the magnetic field lines to pass through the confinement rings, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re*

Keller, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). One of ordinary skill in the art would recognize the problem of installing confinement rings within the chamber of Imafuku et al. as a mechanical problem, any solution to which would result in the confinement rings having the *claimed* spatial relationship between the confinement rings and the magnetic field lines. Moreover, it is noted that the magnetic field does not extend only in a single line between the first and second magnetic elements of Imafuku et al., but rather consists of multiple magnetic field lines that form a distribution such that magnetic field lines would pass through a confinement ring positioned outside, directly between, or inside the magnetic field elements, *as recited in Claim 2*.

Specifically in regards to Applicant's argument against the rejection of Claim 5, that the combination of Imafuku et al. and Lenz does not expressly teach the *specific* spatial relationship between the magnetic field elements and the confinement rings, this is recognized. For that reason, the rejection is further based on Examiner's argument that the inner and outer diameter of the confinement rings is not believed to cause a difference in performance of the apparatus, since narrower or wider confinement rings would still be just as capable of closing and opening the variable gap. Therefore, the relative dimensions between the confinement rings and the magnetic elements is similarly considered not to patentably distinguish the claimed invention from that taught by the combination of Imafuku et al. and Lenz. In *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), the Federal Circuit held that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device

Art Unit: 1763

having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device.

In response to applicant's argument that the cited prior art does not expressly teach that the purpose of the combination of the magnetic field and the confinement rings is to magnetically enhance the physical confinement of the plasma, wherein the magnets direct charged particles into the confinement rings and/or cause them to collide with the confinement rings, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). The apparatus taught by the combination of Imafuku et al. and Lenz is structurally the same as the claimed invention, and Examiner contends that such apparatus would inherently produce interaction between the plasma and the confinement rings as recited in Claim 3, *due to the interaction between the magnetic field and the charged particles of the plasma*. This assertion of inherency is not based, as Applicant asserts, on "probabilities or possibilities," but rather on a cogent technical reasoning that the same mechanical arrangement will behave in the same manner under the same processing conditions. Moreover, Applicant has not provided any evidence tending to show any unexpected results obtained in combining the use of magnetic elements as taught by Imafuku et al. and confinement rings as taught by Lenz.

Conclusion

5. Applicant's amendment necessitated any new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maureen G. Arancibia whose telephone number is (571) 272-1219. The examiner can normally be reached on core hours of 10-5, Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1763

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Maureen G. Arancibia
Patent Examiner
Art Unit 1763



Parviz Hassanzadeh
Supervisory Patent Examiner
Art Unit 1763